

# ECONOMIC IMPACT: 2016-2021

Contact:

Louis P. Kassa, MPA

Lou.Kassa@pabiotechbc.org

PA Biotechnology Center

3805 Old Easton Road

Doylestown, PA 18902

Tel: 215-589-6300

[www.pabiotechbc.org](http://www.pabiotechbc.org)

## Table of Contents

<b>EXECUTIVE SUMMARY</b> .....	2
<b>Quantifying Economic Impact</b> .....	3
<b>Summary of Study Results</b> .....	3
<b>INTRODUCTION</b> .....	4
<b>The Model</b> .....	4
<b>ACTIVITY REPORT: 2016-2021</b> .....	5
<b>A Successful Biotechnology Incubator</b> .....	6
<b>Beneficial Impact on the Region’s Economy</b> .....	7
<b>Examples of Success</b> .....	8
<b>FUTURE IMPACT</b> .....	9
<b>Appendix A: Economic Impact 2016-2022</b> .....	10
<b>Aggregate Economic Impact</b> .....	10
<b>Job Impact</b> .....	10
<b>Comparison with Prior Analysis</b> .....	11
<b>Appendix B: Methodology</b> .....	12
<b>Appendix C: Facilities Overview</b> .....	13



## EXECUTIVE SUMMARY

The creation and development of business and innovation centers for the biotechnology industry is designed to replicate the successful functioning hubs of the industry in the United States, such as Research Triangle Park in North Carolina, Kendall Square in Boston, and South San Francisco. This design is intended to attract technology, talent, and capital into concentrated geographies, to spur new discovery, business formation, technology transfer and commercialization.

To be sure, biotechnology business and innovation centers can attract a variety of resources under one roof, to create powerful synergies that increase the opportunity for accelerated economic growth. While large-scale efforts in the large biotechnology hubs are often the examples touted in best practice studies, there are other good examples of success on a smaller scale that are also creating economic growth opportunities.

One such example is the Pennsylvania Biotechnology Center (PABC) in Doylestown, Pa. The PABC was established in 2006 by the Hepatitis B Foundation with support from the Commonwealth of Pennsylvania Redevelopment Authority and the assistance of Ben Franklin Technology Partners of Southeastern Pennsylvania. The building was renovated to create research labs and offices to house nonprofit research organizations and biotech companies under one roof. Over the years, two adjacent buildings were purchased and renovated in response to the growing biotechnology sector. And in 2021, a two-story state-of-the-art building was completed, increasing the PABC square footage to nearly 150,000 square feet of labs and offices; bringing even more biotechnology research opportunity to Bucks County (Appx. C).

As shown in this report, the PABC has proven itself to be one of the most productive life-sciences incubators in the country. It has been fully or partly responsible for bringing forward several new drugs, several new billion-dollar companies, and thousands of jobs, while fostering a world-class knowledge community. There are currently 50+ startup companies at the Center. Some of these companies have seen their drug discoveries and medical devices approved by the U.S. Food and Drug Administration (FDA), have reached over \$15 billion in combined valuations and have been bought out by major pharmaceutical companies.

The PABC is truly unique with its wealth of resources and core group of nonprofit scientists and educators motivated to work collaboratively with their commercial colleagues on common research themes. Without its presence, it is unlikely that a productive center for biotechnology research and business development would be functioning in the heart of Bucks County. Now, the PABC is a self-sustaining innovation community along the lines of Kendall Square and Research Triangle Park—right here in suburban Bucks County, Pennsylvania.

The research and analysis on the economic impact of the PABC presented here (Appx. A) was conducted by *KLIOS Consulting, LLC*, Richard M. Stein, Principal, and commissioned by the PABC. Data collection and report writing was prepared by Judith Marchand, Baruch S. Blumberg Institute.

**"I have been to many life sciences incubators over the years and none have the talent and energy that I found at PABC. They are certainly one of the best in the country and their track record speaks for itself."**

*Terry Rea, Former Acting Director of the United States Patent and Trademark Office, currently at the firm Crowell & Moring LLP.*

## Quantifying Economic Impact

Three prior studies have examined the economic impact of PABC since its creation: a 2009 report looked at the Center's impact from 2006 through 2008 (three years), a 2013 report examined the period 2009 through the first half of 2013 (4.5 years), and a 2016 report examined the period 2013 through 2015 (three years). This report examines the period 2016 through 2021 (six years).

Economic impact analysis provides a framework to measure direct economic activity relating to new inputs, research, development, and other interventions within the local economy and to model how those interventions flow through the rest of the economy (interindustry linkages). Among the measures that can be tracked are economic outputs in the local economy as well as job creation and retention. The ripple effects, as direct economic activity generates activity in other industrial sectors, as well as the household sector (retail activity), can be measured through the application of a set of economic multipliers. In total, these measures quantify the impact of new economic activity.

### PABC's economic impact: \$7.3 billion!



The PABC continues to grow and, even during the pandemic, makes a major impact on the regional economy.

A new analysis of government and private data shows PABC injected **\$7.3 billion** into Pennsylvania's economy from 2016 to 2021.

- **\$6.3 billion** economic impact in Bucks County
- **\$1.0 billion** economic impact elsewhere in Pennsylvania (excl. Bucks County)

Labor impact includes

- **500** jobs associated with PABC
- **635** jobs in PA from additional spending and output in Pennsylvania (excl. Bucks County)

## Summary of Study Results

The current total economic impact from the Pennsylvania Biotechnology Center and its affiliated organizations over the six-year study period (2016 - 2021) amounts to **\$7.3 billion** for the Commonwealth of Pennsylvania. (Appx. A)

The economic impact can be classified into three categories: direct, indirect, and induced.

- Direct impact is a result of spending and economic activity at the PABC. For the study period, this amounts to **\$2.3 billion**.
- Indirect impact is economic impact generated elsewhere as a result of initial economic activity at the Center. For the study period, this amounts to **\$3.5 billion**.
- Induced impact is economic benefit related to additional household spending created as a result of the PABC's activity and the related indirect economic activity. For the six-year study period, this amounts to **\$1.5 billion**.

The corresponding labor impact includes direct (primary impact) and indirect (secondary) jobs. That includes:

- **500** jobs directly associated with the Center.
- **635** indirect jobs as a result of additional spending and output.

# INTRODUCTION

## The Model

Life sciences and biotechnology business and innovation centers are designed to attract technology, talent, and capital into concentrated geographies, in order to spur new discovery, business formation, technology transfer and commercialization. That is, to create new products to improve human and animal health and to grow high value, high wage employment within a region. Life sciences and biotechnology business and innovation centers can attract a variety of resources under one roof and create powerful synergies that increase opportunities for accelerated economic and commercial growth.

### PHILADELPHIA BUSINESS JOURNAL

The Philadelphia Business Journal called the Center one of the 50 most important places in the region, which will transform southeastern Pennsylvania.

Philadelphia Business Journal, Feb. 2015

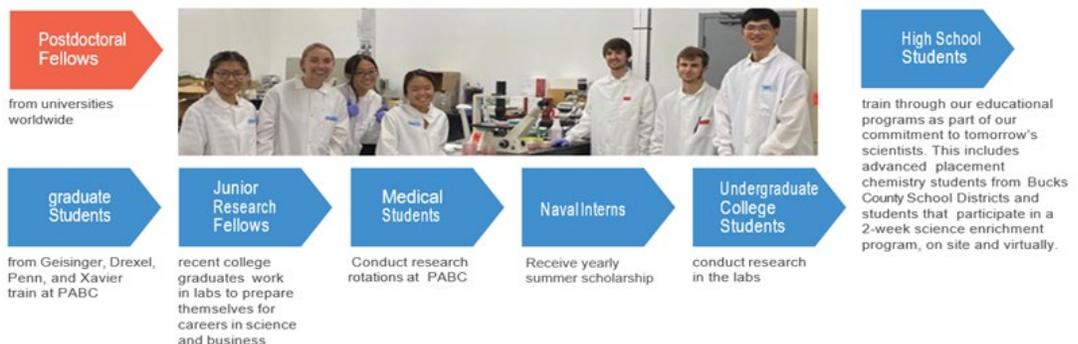
The PABC has been a striking success, thriving through the great recession and the global pandemic, while continuing to grow through the recoveries. It uses an unusual, if not unprecedented, model in which a nonprofit, the Baruch S. Blumberg Institute (“Blumberg”) dedicated to translational research activity, spins out new companies while also attracting new entrepreneurs to the PABC, who, in turn, create other new companies. These activities create a thriving innovation ecosystem.

In addition, the combination of the PABC and Blumberg brings programs, seminars, educational opportunities, common equipment, and business resources to its shared campus, creating a culture of collaboration and community. The leadership is also actively engaged in assisting companies at the PABC, encouraging them to interact and collaborate with each other, often developing new business engagements. In addition to being a locus for new entrepreneurial activity, the PABC provides a safety net for scientists displaced from large pharmaceutical companies, allowing them to start businesses based on their own industry knowledge and intellectual property.

As to COVID 19, research and discovery was the cornerstone of the national response to the worldwide pandemic. The life sciences industry was essential, continued to operate and even needed to expand—and this is reflected in the activity at the PABC. Numerous state and federal grants, exceeding \$35 million in total, flowed to scientists with the Blumberg Institute and PABC-member companies to support anti-viral work, including testing, vaccination, and therapeutics.

The PABC is both a translational research and business center for the life sciences industry offering laboratory, office, and event space to nonprofit research companies and biotech companies. As a world-class incubator-accelerator with its diverse resources and core group of scientists and educators, the PABC seeks to advance biotechnology in Bucks County and the surrounding region; maximize synergies between its scientists and commercial colleagues; and launch new ideas and discoveries that will make a difference in science and medicine.

### TRAINING THE LEADERS OF TOMORROW



# ACTIVITY REPORT: 2016-2021

The Center continues its mission to establish a supportive environment for translational-focused research on hepatitis and infectious disease, and to also support biotechnology ventures that would form onsite and provide benefit and additional activity to the Greater Philadelphia region's burgeoning life sciences sector. It is a unique model of economic development, in that it:

1. Conducts mission-oriented research through the anchor institution of the Baruch S. Blumberg Institute.
2. Nurtures early-stage companies for the targeted outcomes of discovering better ways to treat infectious diseases and cancer.
3. Fosters other technological innovation that impacts biomedical research and the larger life sciences industry.
4. Provides educational opportunities for high school and college undergraduate and graduate students.
5. Replicates its successful model within the community and the region.

Today, the Center plays an important role in the interface between sound academic science and the resulting business opportunities. Blumberg's prominent research endeavors have served as a catalyst for the recruitment of renowned research faculty, new business formation of both diagnostic and therapeutic companies, and the relocation of companies to the PABC with existing synergies to Blumberg's research. The strategic plan for the Center and research affiliates remains to conduct translational research, spin-out technologies from that research, support biotechnology ventures that grow the economic base of Bucks County and provide jobs for a highly skilled and educated workforce.

Having just completed a \$20M expansion project, adding a new two-story, 37,500 square foot structure that connects with its three existing buildings. The PABC now comprises approximately 150,000 square feet of useable space on a 14-acre campus. The new building provides an additional 29 laboratories, 40 offices and conference rooms, a 100+ seat event space, and will create over 100 new jobs.

The Center now provides an even more unique engine for entrepreneurial innovation that is demonstrably valuable for all who seek an accelerated pace of research. This expansion of space brings substantial benefit to the Commonwealth of Pennsylvania, the Southeastern Pennsylvania region, and the County of Bucks. PABC is attracting exciting global companies such as Proteovant Therapeutics, a biotechnology company that utilizes protein degradation research in the development of medicines for disease; California based IGM Therapeutics' Infectious Disease unit and Autoimmunity and Inflammation group; and Antengene Corporation, a cancer therapeutics biotechnology company that created a US subsidiary and established its headquarters at the Center.

The PABC's recent success caught the attention of executives with Brandywine Realty Trust (NYSE: BDN), who approached Blumberg Institute leadership about potentially replicating the model in Philadelphia. Multiple conversations resulted in the creation of B.Labs at Cira Centre, a new custom-renovated incubator space. Opened in January of 2022, B.Labs occupies three floors of a landmark high-rise in University City.



## A Successful Biotechnology Incubator

The International Business Innovation Association 2018 Impact Index, an independent study, found that the Pennsylvania Biotechnology Center outperforms the majority of its 148 peer institutions in areas that indicate success. It ranked first or second among peers in most areas, including a combined **peak valuation of \$1.75 billion for graduate**

**companies.** This report confirms that its ecosystem is unique to the Center, having many components that include nonprofit partners, academics, sophisticated shared resources, and community collaboration. Combined with a selection process geared to new entrants who can contribute to mutual growth, the PABC environment is especially nurturing and conducive to launching new ideas and discoveries.



ONE OF THE NATION'S  
MOST SUCCESSFUL  
LIFE SCIENCES INCUBATORS

PABC Named One of the Most Successful Biotech Incubators in the Country by the International Business Innovation Association 2018 Impact Index

*The Center has helped in the growth and success of so many innovative new companies. This report confirms that our unique approach of encouraging collaboration and entrepreneurship is highly effective in building successful companies.*

There are more than 400 scientists, staff, and students at the PABC, in a knowledge community rich in entrepreneurship but retaining an intellectual and scholarly culture including graduate, college and high school students, weekly scholarly seminars and considerable shared resources. It is a spectacularly lively and successful place, built in an old factory, but now with some of the most accomplished drug discovery scientists in the world.



For example, there are eight individuals working at the PABC over this time period who have discovered drugs which are now FDA-approved, including Mike Sofia, PhD, who won the 2016 Lasker Prize for leading the discovery of a cure for hepatitis C; and Kunwar Shailubhai, PhD, whose drug TRULANCE was approved for treatment of chronic constipation in 2017; taken together, four of these FDA-approved medical products or treatments have been developed by companies while at PABC. Having scientists of this caliber at the center creates an outstanding environment and mechanisms for nurturing discoveries in to use.

## Beneficial Impact on the Region's Economy

The PABC has had a remarkable beneficial impact on the region's economy. In just the past 5 years, companies at the center, or from the center, have raised nearly \$2 billion from Initial Public Offerings (IPO), stock offerings and direct investment. There have also been significant acquisitions. The table below summarizes the major events at the Center, although it is noted that only the top seven transactions are listed. As referenced throughout this document, there are also scores of other, lower value, investments and transactions that have occurred in the center, totaling nearly \$200 million, in aggregate.

EXAMPLE OF SUCCESSFUL COMPANIES FROM THE PABC			
Company	IPOs/raises/acquisitions*	Est. Peak Value*/Date	
Antengene Corp. <sup>1</sup>	\$550	\$3,000	Nov-20
Arbutus Biopharma <sup>2</sup>	\$200	\$1,000	Mar-15
Century Therapeutics	\$600	\$1,000	Jun-21
IGM Biosciences <sup>3</sup>	\$390	\$3,600	Feb-21
PMV Pharmaceuticals	\$1,000	\$2,200	Sep-20
Tiziana Life Sciences	\$56	\$1,200	Jul-20
Novira Therapeutics <sup>4</sup>	\$640	\$600	Dec-15
*In millions			
<sup>1</sup> R&D and US headquarters/CEO offices in PABC, overseas activity			
<sup>2</sup> Arbutus stock offering via reverse merger of Oncore and Tekmira			
<sup>3</sup> Infectious diseases and its autoimmunity and inflammation R&D are headquartered at PABC, home office: California			
<sup>4</sup> Final exit in 2016			

Thus, although dollar investment and exit activity isn't the only way to value an innovation center, and it itself is not a perfect metric for economic impact, it does serve to highlight some of the more extraordinary events of the past six years.

## Examples of Success

**Antengene, Corp.** spun out from Cellgene when Cellgene merged with Bristol Myers Squibb in 2018. In just a few years Antengene had its initial IPO, raised more than \$500 million, and had its anti-cancer drug, Selinexor, approved by the U.S. FDA. *Jay Mei, MD, PhD*, Founder, CEO and chairman, has immediate plans to expand the company to include several additional labs, and dozens of new employees.

**Century Therapeutics**, which is developing a novel cell therapeutic approach to address previously incurable solid tumors and hematological malignancies, was started by *Lalo Flores, PhD*, at the PABC before it was renamed to Century Therapeutics. Now at the forefront of Philadelphia's cell and gene therapy revolution, Century, a publicly traded company after its IPO in June 2021, raised more than \$600 million even before its first product has entered clinical trials, such is the promise of its technology. Dr. Flores also co-founded another company at the PABC, Novira Therapeutics, and served as its President and Chief Scientific Officer. He successfully completed the acquisition and integration of Novira with Johnson & Johnson for \$600M before creating Century. Needing expansion space, the company moved to Philadelphia, Pa.

**PMV Pharmaceuticals** is developing new cancer therapies, uniquely targeting the p53 "anti-oncogene" protein with small molecules that restore its function. In 2020, PMV Pharma had its IPO and has raised more than \$243 million. It is now valued at more than \$1 billion. The company was created at the PABC in 2013 with technology from Princeton University scientists who were the first to identify p53 function and develop drugs that can restore its function. *Thomas Shenk, PhD* is co-founder of PMV with Drs. David Mack and Arnold Levine. Intellectual property from Dr. Shenk's lab has fueled multiple start-ups with successful exits, and he continues to launch, or serve as Scientific Advisor for, several companies at the PABC.

**OrthogenRx, Inc.** is a late-stage development company that was formed in August of 2012 and moved its headquarters to the PABC in 2013. Started by *Michael Daley*, CEO and Founder, with *David Toledo, PhD*, senior vice president, they raised more than \$4.75 million to develop GeneVisc850 and TriVisc, two orthopedic medical devices for the management of osteoarthritis and approved by the US FDA. Needing expansion space, OrthogenRx left the PABC but remains in Doylestown. The company has had more than \$30 million in sales and was acquired in 2021 for \$161 million by Avanos Medical, Inc.

**Synergy Pharmaceuticals**, while at the PABC, discovered a totally new concept for treatment of gastrointestinal diseases. Led by *Kunwar Shailubhai, Ph.D.*, and former Co-Founder, EVP and CSO, this pioneering discovery ultimately led to the 2017 FDA approval of TRULANCE, a drug currently in market for treatment of irritable bowel syndrome and chronic idiopathic constipation. This success led to Synergy's IPO in February 2017, closing at \$121.6 million.

## What they are saying...

*"We are very excited to start a more extensive partnership with colleagues/companies at the Center, and to utilize the various available resources to help our drug discovery stage programs, and business development effort."*

*Jay Mei, Antengene, Corp.*



*"As a biotech scientist, entrepreneur and executive I have seen how the PA Biotechnology Center has grown and thrived and delivered accomplishments in science, biotechnology and entrepreneurship that go way beyond expectations."*

*Lalo Flores, Century Therapeutics*



*"The Center has greatly evolved since its origin in 2006, into a true focal point for biotechnology research, development, and entrepreneurship."*

*Tom Shenk, PMV Pharmaceuticals*



*"The biotech center was critical toward our success.... the PABC has indeed been that partner that has allowed us to be successful..."*

*Mike Daley, OrthogenRX*



*"The Biotech Center is an excellent atmosphere for scientific research as well as for interaction with other scientists and entrepreneurs..."*

*Kunwar Shailubhai, Synergy Pharmaceuticals*

# FUTURE IMPACT

In its early stages, the focus of the Center was to attract other scientific organizations, both nonprofit and for-profit, to create the synergistic dynamic needed for success. That success has been realized, and the Center is now home to more than 90 members, and experiences continuing demand for additional space. This comes from the organic growth of the community and from outside organizations who view the Center as a place where they see the potential for their ideas to take root and succeed. It fully anticipates an increase in its public/private partnerships, expansion of academic opportunities and replication of its successful model through these partnerships and in the community at large.

***The vision in 2022 is the same as it was in 2016: weave an even stronger knowledge community consisting of high-value personnel that will be known in Bucks County, the region, and the State of Pennsylvania as a true accelerator of biotechnology growth.***

## Future Vision & Impact



**BUSINESS INNOVATION**  
HELPING ENTREPRENEURIAL COMPANIES GROW AND THRIVE



**CONNECTING TO CAPITAL**  
ENHANCING REGIONAL TECHNOLOGY TRANSFER CAPABILITY AND INCREASING AVAILABILITY OF GROWTH AND CAPITAL



**COMMUNITY BUILDING**  
EXPANDING BUCKS COUNTY'S INNOVATION COMMUNITY



**EDUCATION AND WORKFORCE DEVELOPMENT**  
BUILDING A PIPELINE OF SPECIALIZED KNOWLEDGE WORKERS WITH STEM INDUSTRIES



**INFRASTRUCTURE FOR INNOVATION**  
PROVIDING THE PHYSICAL ASSETS THAT ALLOW INNOVATION CLUSTERS TO FLOURISH

### The PABC is proud to serve as a place of discovery and innovation for its members

Advanced Neural Dynamic	Channel Methods Partners LLC	IGM Biosciences	OrthogenRx
Advanced Vertebral Solutions	CHS Consulting	ImCare Biotech	Pennsylvania Drug Discovery Inst.
Advent Therapeutics	Citrin Cooperman	Innate Biologics LLC	Pharmabridge Inc.
Alliance Discovery	Conifer Point Pharmaceuticals	Intellika AI	Pharma Green LLC
ALS BioPharma	DarkMatter2bd	IO BioSciences	Power 4 LLC
AMRA Medical Inc.	Diagnosearch Life Sciences	IteraMed Inc.	Premier Focus Solutions
Ancillare LP	Doylestown Translation Services	JBS Science	Proteovant Therapeutics
AniMed Biologics	Eliksa Therapeutics	J.N. Solutions Inc.	Qrumpharma
Antengene Corporation	Emergex Vaccines	KannaLife Sciences Inc.	Recombination Therapeutics, LLC
Arbutus Pharmaceuticals	Epidarus Therapeutics	Lam Drug Discovery	SA Laboratories Inc.
Artemis Solutions	Evrys Life Science LLC	Life Sciences Workforce Inst.	Seneca Therapeutics, Inc.
ArVin TaH Ltd.	Exios Bio LLC	Linnaeus Life Sciences LLC	Serologix
Assist Panacea LLC	Exocel Bio	Maria Valentino, LLC	Sequor
Atrin Pharmaceuticals	Finch Paolino LLC	Medix	Shams Consulting LLC
Baruch S. Blumberg Institute	FloBio	Mid-Atlantic Bio Therapeutics, Inc.	Single Use Surgical
BioPhysical Solutions	FlowMetric Life Sciences Inc.	Natural Energy Lab LLC	Sterotherapeutics LLC
Binder Industries Inc.	Fox Chase Chemical Diversity Ctr. Inc.	N-Zyme Scientifics, LLC	Stranexa LLC
Boston Analytical	Geisinger Commonwealth School of Medicine	Neovars Therapeutics	Sulagen LLC
Brian Eves Esq.	GeneLancet Biosciences	Neoventech	Tescor Inc.
The Bracken Group	Greene Street Pharmaceuticals LLC	NeuEsse Inc.	Tiziana Life Sciences
CadenzaMed LLC	GTS Recruiting	Neuropathix Inc.	Tunnell Consulting
CaPrivate Pharmaceuticals LLC	Hatch Biofund	NYBEE NEW YORK INC.	VIAS Partners, LLC
Catemer Inc.	Hepatitis B Foundation	OCMS Bio. LLC	

## Appendix A

**ECONOMIC IMPACT 2016 - 2022****Aggregate Economic Impact**

The total economic impact from the Pennsylvania Biotechnology Center of Bucks County and its affiliated organizations—the Hepatitis B Foundation (founding organization), the Baruch S. Blumberg Institute, and the Pennsylvania Biotechnology Center as well as a co-located but unrelated warehouse and distributions facility<sup>1</sup>, amounts to \$7.3 billion for the Commonwealth of Pennsylvania.

The economic impact can be classified into three categories: direct, indirect, and induced.

**Impact Detail** - To determine the economic output of the Center's activities, the appropriate multipliers for Pennsylvania and Bucks County are applied to each category of output and then totaled.

**Indirect and Induced Economic Impact** - The indirect and induced effects generated additional spending throughout the economy. Economic multipliers based on the type of spending are used to calculate interindustry (supply chain) and personal or household spending impacts.

<b>Economic Impact, Pennsylvania Biotechnology Center of Bucks County (\$Millions)*</b>			
	<b>Bucks County (A)</b>	<b>Pennsylvania other (B)</b>	<b>Total Pennsylvania (A+B)</b>
<b>Direct (1)</b>	\$2,319	\$0	\$2,319
<b>Indirect (2)</b>	\$3,246	\$254	\$3,500
<b>Induced (3)</b>	\$761	\$748	\$1,509
<b>Total (1+2+3)</b>	<b>\$6,327</b>	<b>\$1,002</b>	<b>\$7,329</b>
*Numbers may not add due to rounding.			

**Job Impact**

A total of 1,135 jobs were created through the activities at the Center during the study period. The corresponding labor impact includes 500 jobs directly associated with organizations at the Center (and the co-located warehouse and distribution facility). Spending and output related to those jobs spills over and is associated with another 635 jobs in the Commonwealth — in total, 1,135 direct (primary impact) and indirect (secondary) jobs. Indirect job impact is based on revenues received for goods and services. Revenues generated at the Center totaled \$243 million during the study period.

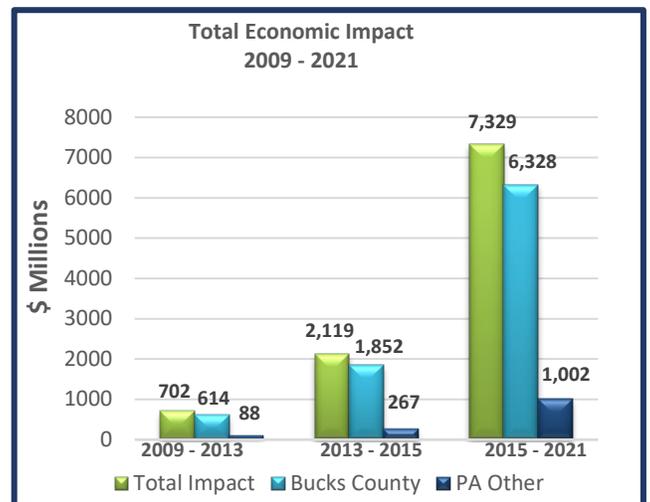
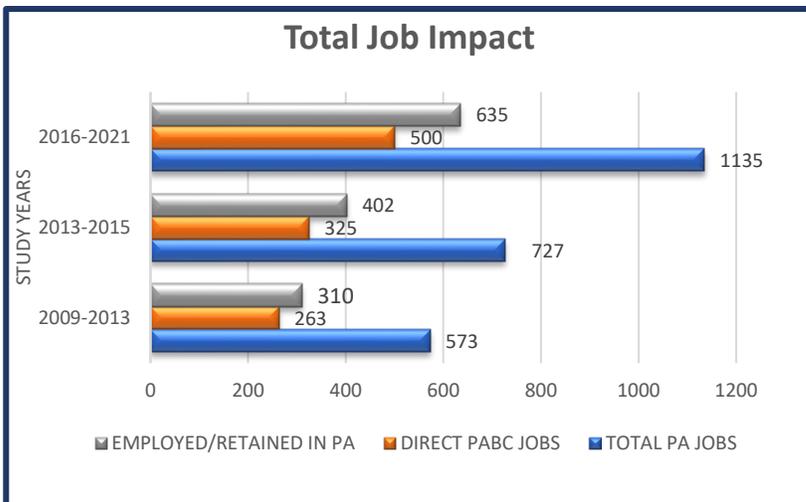
<b>Labor Impact, Pennsylvania Biotechnology Center of Bucks County (Jobs)</b>			
	<b>Bucks County (A)</b>	<b>Pennsylvania other (B)</b>	<b>Total Pennsylvania (A+B)</b>
<b>Direct (1)</b>	500	0	<b>500</b>
<b>Indirect (2)</b>	371	264	<b>635</b>
<b>Total (1+2)</b>	<b>871</b>	<b>264</b>	<b>1,135</b>

<sup>1</sup> The operation, The Candlewic Company, has been a longtime occupant at the site, preceding the opening of the PABC in 2006. It currently leases space from the PABC.

## Comparison with Prior Analysis

In addition to the current analysis two prior studies of the Center were conducted, using a similar methodology: a 2013 report looked at the Center's impact from 2009 through 2013 (4.5 years), and a 2016 report examined the period 2013 through 2015 (three years). It is possible to compare the results of each study, side-by-side, and therefore get some idea of the Center's impact since its origin.

DATA COMPARISON 2013-2021						
	Current Analysis (2022)		2016 Analysis		2013 Analysis	
Study period	2016-2021 (6 yr)		2013-2015 (3 yr)		2009-2013 (4.5 yr)	
	\$Millions	Bucks:PA other split	\$Millions*	Bucks:PA other split	\$Millions*	Bucks:PA other split
<b>Economic Impact</b>						
Total impact (direct/indirect/induced)	\$7,329	100%	\$2,119	100%	\$702	100%
- Bucks	\$6,327	86.3%	\$1,852	87.4%	\$614	87.4%
- PA other	\$1,002	13.7%	\$267	12.6%	\$88	12.6%
Direct impact (Bucks)	\$2,320	0%	\$696	0%	\$230	0%
Indirect impact	\$3,500	100%	\$984	100%	\$308	100%
- Bucks	\$3,248	92.7%	\$932	94.7%	\$297	96.8%
- PA other	\$254	7.3%	\$52	5.3%	\$10	3.2%
Induced	\$1,509	100%	\$439	100%	\$439	38%
- Bucks	\$782	50.4%	\$223	50.9%	\$87	19.9%
- PA other	\$748	49.6%	\$215	49.1%	\$79	17.9%
*Current (inflation-adjusted) dollars						
<b>Labor impact</b>						
Total jobs in PA	1,135	100%	727	100%	573	100%
Direct jobs - PABC	500	44.1%	325	44.7%	263	45.9%
Indirect jobs (employed/retained in PA)	635	55.9%	402	55.3%	310	54.1%
- Bucks	371		237		184	
- PA other	264		165		126	



# METHODOLOGY

The impact of the Pennsylvania Biotechnology Center on the Commonwealth's economy was calculated for the period 2016 to 2021. Economic impact analysis allows examination of the effects of a specific event or events on a given (geographic) economy. Total economic impact includes the direct impact of spending, including research and development, investment, construction, and other expenditures over the period, by companies associated with the facility. In addition, the study examined indirect and induced effects that occurred as a result of economic activity (i.e., spending) by Center organizations rippling through the economy and generating spillover benefits to additional companies, as well as to the household sector. At every point, new spending occurs, and new jobs are created. That spending and those jobs continue to ripple through the economy for additional rounds of economic activity. Economic multipliers quantify the total impact within the Commonwealth of successive rounds of spending as a result of direct expenditures by organizations associated with the Center, as well as additional employment related to the new spending.

- Indirect impacts refer to additional rounds of spending made by organizations and businesses with industry (supply chain) linkages to the Center. Initial spending by entities at the Center supports additional rounds of spending up and down the supply chain.
- Induced effects refer to the increased household consumption of goods and services (for example, housing, utilities, retail spending) throughout the economy.

To determine indirect and induced impacts, economic multipliers are applied to direct economic activity associated with the Center. The multipliers express the additional dollars of output as a result of new economic activity by companies and organizations associated with the Center.

The study utilized a methodology and model based on the Regional Input-Output Modeling System (RIMS II) produced by the US Department of Commerce Bureau of Economic Analysis. This methodology produces multipliers used in economic impact studies to estimate the total impact of a project on a region.

Research and analysis was conducted by *KLIOS Consulting LLC*, Richard Stein, Principal. *KLIOS* is a management and economic consulting firm that works with public and private institutions on issues relating to innovation, growth and sustainable economic development.

Appendix C

PABC FOOTPRINT

